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STABILIZATION OF SOVIET TANK GUNS

Colonel General B. M. Korobkov

Despite the perfection of modern suspension arrangements and the use of shock absorbers, it is impossible to eliminate completely the swaying of a tank. To improve the accuracy of gunfire, the gun is stabilized in certain modern tanks, that is, with the aid of special devices, the gun is maintained in the desired position despite the swaying of the tank.

Stabilization is based on the well-known properties of a gyroscope; the gyroscope maintains the position of its axis through rapid rotation. The gyroscope is widely used in all fields of military science. It is used in an airplane to stabilize the course of flight (gyropilot), on ships (gyrocompass, automatic steering devices), on submarines, etc. The arrangement of a two-wheeled bicycle is based on the principles of a gyroscope. While the wheels are turning with sufficient speed, the bicycle is stable, despite the fact that the person seated on it changes the position of his body. If the bicycle were not in motion, the person would fall.

To turn a rapidly spinning round object on its axis, for example, a bicycle wheel, force must be applied because the wheel offers resistance. The faster the wheel is spinning, the heavier the wheel and the larger its diameter, the stronger the resistance. In this way, every rapidly spinning object seeks to maintain the original position of its axis.

The hull and, consequently, the turret of a tank, as mentioned above, are subject to two man types of swaying: vertical, were the tank's hull shifts parallel to its axis /pitches/, and angular, where the hull shifts about its center of gravity /rolls/. This swaying causes the gun to be unstable since it is attached to the turret by trunnions.

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To stabilize the gun, a rapidly spinning gyroscope is mounted on it [illegible] of a stabilized gun is mounted freely on trunnions and can change its position relative to the turret The gyroscope, an electric motor with a large armature (rotor), is fixed to the body of the gun by brackets The rotor of the gyroscope begins its rotation, which usually reaches a speed of 8,000-12,000 revolution per minute If the tank sways vertically only, the hull, turret, gun, and gyroscope shift back and forth There will be no stabilization in that case. Actually, if one were to move a rapidly spinning bicycle wheel up and down in relation to its axis, it would offer no resistance (except, of course, for the weight of the wheel)

But it is another matter if the tank's hull and turret sway at an angle [illegible] Now the gyroscope seeks to maintain the position of its axis Since it is joined to the gun, the latter also will seek to maintain the position of its axis, that is, will not sway with the turret The barrel of the gun, as well as the axis of the gyroscope, will maintain its original position as set by the gunner The gun will be stabilized

The stabilization of guns with the aid of a gyroscope has long been in use on ships Huge gyroscopes are also used for the stabilization of the vessels themselves Stabilization of tank guns was first employed in American tanks during World War II The arrangement of American stabilizers differs to a certain extent from those described here The gyroscope in American stabilizers does not affect the barrel of the gun directly but only controls the valves of a hydraulic device which shifts the gun in the needed direction. Since a gyroscope is small in size, inasmuch as the opening of valves requires very little force, but the entire installation is considerably more complex [illegible] a stabilizer operates in exactly the same fashion as the far simpler one considered here

Inasmuch as the stabilization of a gun requires a rather complex installation, sometimes stabilization is used on the gunsight alone Under this system the line of aim does not vary, and the shot is made when the gun, in its swaying, reaches the position corresponding to that of the sight

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